Bachelor Business Administration and Economics 6th Semester

Macroeconomics and Behaviour

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Klaus Wälde (lecture) and Alexey Cherepnev (tutorial)
www.macro.economics.uni-mainz.de

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Problem Set 4

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Question 1

Suppose preferences for consumption c and leisure l are

$$U(c,l) = \frac{1}{\theta} \log \left[\gamma c^{\theta} + (1-\gamma) l^{\theta} \right], \ \theta < 1. \tag{1}$$

with real budget constraint

$$c = (\bar{l} - l) w, \tag{2}$$

where $\bar{l}$ is the total available number of hours and w is the wage. Find

a) the marginal rate of substitution between consumption and leisure

$$\frac{\partial U(c,l)/\partial l}{\partial U(c,l) \partial c} = w; \tag{3}$$

b) the general labour supply equation:

$$l = \frac{1}{1 + \left(\frac{\gamma}{1-\gamma} \right)^{\frac{1}{1-\theta}} w^{\frac{\theta}{1-\theta}}} \bar{l} \tag{4}$$

Question 2

Given an exogenous separation probability s and an exogenous job matching rate μ, formulate how unemployment $u(t)$ changes over time in response to the flows in and out of jobs. In doing so,

a) explain in words the following first-order differential equation:

$$\dot{u} = s(1-u) - \mu u, \tag{5}$$

where a dot denotes a time derivative;

b) check that

$$u = \frac{s}{s+\mu} + \left(\bar{u} - \frac{s}{s+\mu} \right) e^{-(s+\mu)t} \tag{6}$$

is the solution of equation (5) and show the existence and uniqueness of the steady state solution of (5) based on a phase diagram.

c) Given the solution (6) and values $s = 0.01$ and $\mu = 0.19$, compute how long it takes to reduce the unemployment rate from 11% (Germany 2005) to 5% (Germany 2014).